Cabinet Office
Information Technology Advisory Panel

Making a Business of Information

A survey of new opportunities

September 1983

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First Published 1983

ISBN 0 11 630824 9

Rt Hon Margaret Thatcher MP
Prime Minister
10 Downing Street

Since the publication of our report 'Cable Systems' in March 1982, we have continued to advise you and your colleagues on key issues in information technology. We have also carried out a broad survey of one aspect of IT which we believe has had insufficient attention and the report from that study we now submit to you.

It concerns the implications of IT for those who are engaged in supplying information (defined widely to include not only factual material but also entertainment) to others, often in a commercial environment. Technological developments are eroding past distinctions – between book publication and film distribution, or between writers and publishers for example. They are creating major world-wide opportunities for the supply of information, opportunities well suited to the creative talents of the British people.

Within IT policy, attention has up to now been focussed on the technologies of computing and communications and the technical capabilities of new information systems – the T of IT. We are asking in this report for more attention to be paid to the I of IT, the organisation and delivery of information in new ways and the creation and maintenance of the commercial value of that information. With such a change in perspective, we believe that the United Kingdom can attain a leading position in the World markets for such information.

The report is directed as much to the private sector as to Government; and it is private sector interests who must take the main initiatives. To do this, they need to develop an appreciation of the possibilities opened up through IT, and our aim in this report has been to help provide that. We therefore hope that it may be published to stimulate discussion and action.

Signed M J Aldrich
I H Cohen
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D F Hartley
C N Read
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Cabinet Office
June 1983

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Summary

1 The provision of information is an increasingly important commercial activity. Although unrecognised in economic statistics, there is now an expanding 'tradeable information sector' which encompasses the supply of financial and business information, printing and publishing, on-line technical information, consultancies, etc. We consider that the entertainment industry and aspects of education and training services also fall within this sector, since many of the same technological influences bear upon these activities as upon more obviously 'information' activities. Our estimate is that the sector currently employs of the order of 1 million people.

2 New technological developments are bringing together hitherto disparate activities in information supply. The same intellectual property may now be exploited in books, films, video cassettes and interactive computer programs. There are new opportunities – through cheaper and better telecommunications services: teletex, rapid facsimile, satellite links, etc – for the supply of information from the United Kingdom to the rest of the world. This is already a substantial source of overseas earnings. With greater recognition from both Government and the private sector, and vigorous exploitation of technological developments, it could become even more significant. Trade figures show that in the last decade this country has been considerably more competitive in world markets for information services than in those for manufactures.

3 On-line services now underpin much business activity and provide access to scientific and technical literature. In Chapter 4 we identify some of the factors that will influence the provision of new services. Many of these factors apply also to other types of information activity.

4 Government has four major roles that affect the tradeable information sector. It sets the legal and regulatory framework for information services; it is the largest processor of information in the country and, as a major supplier, can also influence the market for new services; it can act as the national focus

for new developments or policy issues; and it can provide financial support. We examine these roles in more detail in Chapter 5.

5. Our main conclusions (with the relevant paragraph numbers in parentheses) are as follows:

i. Both private and public sectors in the United Kingdom need to pay much more attention to information as a commercial commodity, to be concerned with the creation and maintenance of its value, and to take steps to develop the delivery systems that best meet users' needs. While emphasis has so far been placed upon the technological elements of IT, there now needs to be a better perception of the value of the information transmitted over IT systems. (6.2)

ii. The principal responsibility for exploiting the opportunities opened by new computing and communication technologies must rest with the private sector, but Government needs to establish an environment in which new developments will be encouraged. (6.6)

iii. Both industry and Government are fragmented in their approach to this subject. There is a diversity of trade groupings which should seek to come together in a new representative body, better able to promote the development of this sector, while NEDO should consider establishing a Sector Working Party. (6.8, 6.10)

iv. Government, for its part, should review its current scatter of responsibilities and identify one major Department as having lead responsibility for the development of the tradeable information sector. With this should go explicit Ministerial commitment to the importance of this area. (6.12)

v. Government should use its information gathering and supply activities as a means of stimulating the creation and growth of new IT-based information services. There are extensive opportunities for joint ventures with private sector organisations. (6.14)

vi. Copyright legislation is fundamental to the commercial viability of the tradeable information sector. The next Copyright Act must adequately take into account current and foreseeable technological developments, and should be prepared with the aid of the best technical advice. (6.15)

vii. The means by which Government receives information from other organisations should be kept under review in order to promote the widest use of machine-readable data. (6.16)

viii. The development of advanced software for searching databases will be a key factor in the widespread use of on-line services. Government support for appropriate developments will be necessary. (6.16)

ix. Statistics in this area of commercial activity are deficient and Government should revise its statistical classifications accordingly. (6.16)

x. There are major opportunities for the provision of education and training through new technological means and the United Kingdom should seek a leading position in this activity. (6.17)

xi. More academic study of this expanding commercial area should be encouraged through funding from the Research Councils. A new unit to aid policy studies might be established. (6.21)

xii. Government should consider instigating an awareness initiative on the lines of IT Year, perhaps coinciding with the introduction of new copyright legislation. (6.22)

6 From these conclusions we draw three general recommendations:

i. Government should recognise the current economic significance of the tradeable information sector, and the opportunities for future growth, and take its interests into account in policy formation.

ii. Those already active in information supply – in publishing, broadcasting, film-making etc – should closely examine their present activities to identify how new technology is eroding previous distinctions between their particular interests and others with which they may previously have had no contact, and should prepare business strategies accordingly.

iii. Those wishing to stimulate or participate in new business activities should note the many opportunities now being opened up through the use of new technology for the supply and analysis of information, which are suited to an entrepreneurial approach.

1 Introduction

1.1 In the past couple of years, information technology (IT) has been the subject of countless conferences, seminars, workshops, journal articles and newspaper supplements. Much of this attention was stimulated by the Government's designation of 1982 as IT Year and its financing, in conjunction with the private sector, of many activities designed to bring the implications of IT to the attention of different sectors of the community. Specific projects such as the 'Micros in Schools' scheme have introduced new technology to different users. Personal computer sales have soared. And the major debate over the possible development of multi-channel cable systems initiated by our report *Cable Systems* has highlighted further aspects of IT. As a result, surveys have shown that there is an increasing awareness of IT and its significance for social and business activities, and many organisations are now considering carefully how they can compete better through the use of IT to improve their efficiency, increase their scale of operation, or provide new services.

1.2 We welcome these developments. We strongly endorse the central message of the Prime Minister's speech to the Barbican conference in December 1982 that unless Britain successfully harnesses IT in all its aspects we shall not maintain, let alone improve, our competitive position in the world economy. But in the desire to create awareness, to gain attention and to stimulate discussion, emphasis has quite understandably been placed upon the technological capabilities of IT systems – brought about through the rapid development and falling costs of micro-electronics – and not upon the characteristics of the information that is stored, manipulated or transmitted. Put simply, the emphasis has been on the T of IT, and not the I.

1.3 In this report, we wish to restore the balance. In this, we follow the thinking of our previous report, which pointed out not only the technological capabilities opened up by cable systems, but also the opportunities for creative artists and programme makers through the programming required, and for the creation of new types of service. The subject of this report is the developing market for information in many different forms, ranging from academic publications to entertainment. Our thesis is that new technology is eroding many of the distinctions that have previously distinguished one form of information medium from another; publications, films and news services are now all becoming aspects of an expanding 'tradeable information sector'. Government and the private sector both need to recognise this development, to consider carefully its implications for future policies and future markets, and to work together to capitalise the United Kingdom's undoubted strengths in this field.

1.4 We commenced this study thinking that there might be a subject of major importance here. We have finished it quite convinced that there is. We aim to do no more than provide an introduction to those who wish an overview of present developments and their implications, and to stimulate further discussion and debate, inside and outside Government. We hope thereby to assist the development of a climate of understanding in which detailed policy decisions can be developed and implemented. For those who wish to examine the subject further, we offer a selective bibliography in Annex A.

1.5 In subsequent chapters, we outline the range, scale and significance of the tradeable information sector, discuss one activity, the provision of on-line data, in more detail to illustrate some of the features of the information business, consider Government's role and put forward our conclusions.

1.6 In the preparation of this report, we received much assistance from organisations outside Government and officials in Departments. We would wish to acknowledge this, and the support of the Cabinet Office IT Unit (now incorporated in the Science and Technology Secretariat).

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2 Types of information

2.1 Many commentators have pointed out the increasing importance of information handling in the economy. This is closely linked with the rise of the service sector, but not synonymous with that. In the previous chapter, we referred to our subject as the tradeable information sector. Not all information handling takes place in the tradeable information sector – central and local government operations, for example, are predominantly concerned with information handling but are not traded. And even in the private sector, some major information-handling activities, such as banking and insurance, are carried out in order to provide an end service which is conceptually distinct from the supply of 'pure' information. To illustrate the kinds of activities covered in this report, and the technological pressures to which they are subject, we outline below various categories of information which in our view constitute major elements in the tradeable information sector, while Annex B summarises some of the principal technical developments.

i. 'Packaged' information

2.2 We have in mind here information of some permanence easily identifiable by title and author and essentially concerned with a single subject or a group of closely related subjects. A principal component is the great volume of scientific and technological literature now in existence, most of which takes the form of journal articles which can easily be classified, abstracted and indexed. It has been estimated that by the end of 1980, some 60 million papers had been published, and that this total was increasing by some 2.5 million every year. The application of new technology to the storage and retrieval of such information is well developed, with many on-line retrieval services operating (see Chapter 4), enabling rapid searches of complete files to be made and relevant articles identified. The legal field also offers similar opportunities and there are close parallels with some of the services now developing in company and financial information (see below). Some categories of reference material (eg encyclopaedias) also come under this heading. It is quite possible to access such information by electronic means as the individual entries are easily classified.

2.3 Developments in the storage and transmission of information, such as the use of computers accessible from remote terminals and the remote printing of selected articles, will affect the publishing and printing activities associated with journal production, an issue which was examined in a recent study undertaken by the Royal Society. Indeed, the increasing use of word processors (particularly those with communications facilities) for the original production of text will have implications for the circulation of articles even before they are submitted to journals.

ii. 'Semi-packaged' information

2.4 In this category, we include reports that contribute to general knowledge of a subject but are less easily classified by author or subject than traditional scientific or technical articles, and probably of a less permanent nature. Examples are assessments of market prospects produced by stockbroking firms, company reports, legal reports and news digests, and reports on products and services (such as video discs or electronic mail), which are produced by consultants either as private ventures or multi-client studies. As always, one category merges into another and the same influences – availability on screen rather than in print, the potential for remote access, easy assembly of related pieces of information – will affect the production and use of such information, as they will the previous category. These reports form the basis of much commercial and industrial activity, and speed of access and ease of storage, although not as vital as in the next category, can be important – hence the significance of electronic means of production and distribution.

iii. Transient information

2.5 There are two important sectors here – first the range of news and current affairs services, the province of newspapers, magazines, the broadcasting authorities and the news agencies (such as Reuters and Visnews) and secondly the specialised financial, commodity and business news services (eg Datastream, Reuters and Extel) upon which so much of commercial life depends. To the UK, because of the importance of the City in the world's financial and commercial markets, these services are vital, and so dealers, brokers and others have been among the leading users of IT in order to have the most rapid access to information. We recognise that many of the agencies in this field are developing permanent forms of their information.

2.6 Improved telecommunications services, and notably the introduction of satellite links which can serve all parts of the world, will greatly extend the ability of organisations both to receive and to distribute information rapidly and the opportunities now opening for the provision of news and specialised information by such means are legion. Television, for example, has traditionally been nationally orientated, but through satellites the TV equivalent of the BBC World Service is quite feasible, even though there may be institutional difficulties at present in access to suitable satellites, and cultural barriers in receiving countries.

2.7 In our earlier report on cable systems, we made reference to the many opportunities that these will bring for the dissemination of information to both householders and businesses. For the householder these include entertainment and education, as well as telebanking and teleshopping. For many businesses, a cable network will provide an opportunity to subscribe to a wide range of information services at small capital cost. We are pleased to note the Government's positive response to that report.

iv. Permanent information

2.8 Even in an era of rapid change, some information has permanent or archival characteristics. The public repositories of the British Library, the Public Records Office, Companies House and major museums, among others, contain information in many different forms – such as print, manuscript and drawings. Much is valuable to scholars and authors from all countries. The introduction of new methods of mass storage of information, for example optical discs, coupled with rapid facsimile transmission systems (which provide much improved quality over older systems), will enable this material to be accessed both from the UK and from other countries (for an appropriate fee).

v. Skilled judgement

2.9 The opinion of an expert is a valuable commodity. The UK received income of £913 million in 1981 from all forms of consultancy, the professions, technical services, etc, some of which (for example the interpretation of aerial and satellite images) are themselves intrinsically connected with the use of new technology. Improved communications links, particularly video links, will enable our expertise to be made available more easily outside the UK.

vi. Education and training

2.10 This is a major information activity, most of which is in the non-traded sector of the economy. Yet the commercial aspects of education (eg publishing of textbooks) have been a source of profit to UK interests for many years, and the prestige of UK education and the use of the English language still makes a British education attractive to many overseas students. Through IT, such education may be brought to a much larger audience. The use of IT in education and training, both to assist conventional teaching methods and (in the case of the Open University and Open Tech) to provide the main means of instruction, is clearly going to rise. Many new developments will be involved, of which personal computers with educational software, video tapes and discs, viewdata and innovations in broadcasting (such as satellite TV and teletext) are but the most obvious. The whole range of educational institutions, from primary schools to postgraduate institutions, will be affected. The Open University and Open Tech have particular pioneering responsibilities. The traditional 'software' providers, the publishers and broadcasting authorities, will need not only to adopt new technology, but will also be subject to new competition because of it.

vii. Entertainment

2.11 The entertainment industry shares many characteristics with industries more conventionally included in the definition of information. Its product is intellectual property of commercial value, subject to many of the same legal provisions (eg copyright) and distributed by many of the same means. It is subject to the same technological pressures through the advent, for example, of video cassettes and discs and cable systems. And it merges imperceptibly with the provision of information in the mixed programming familiar to British TV audiences. There will thus be an impact from new technology on the broadcasting media, the film industry and the creative arts (such as drama, opera and photography) generally, with new opportunities to make their output available to larger audiences.

2.12 We have indicated above various categories of information and referred to some of the organisations and activities concerned with the supply of information collectively. They constitute in our view the main elements of an activity which is already substantial and which, if appropriately encouraged, would grow appreciably. There are, of course, many ancillary activities associated with this industry, ranging from the supply of the necessary hardware, such as computer terminals, to the multitude of abstracting, indexing, translating and similar tasks involved in the organisation of information services. And at that end of the spectrum particularly, the activities concerned are labour-intensive, although computer assistance is of course becoming more extensive. In the next chapter we examine the current economic importance of the information business.

3 Information in the economy

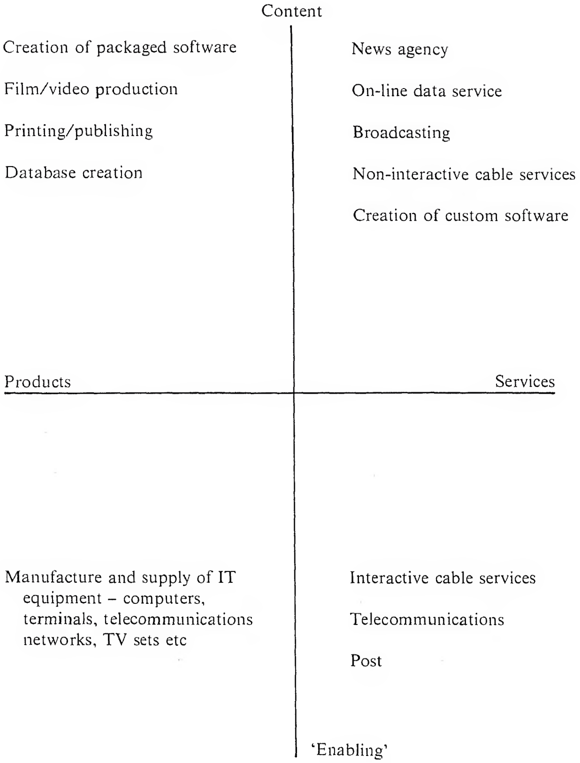
3.1 In the previous chapter, we identified major components of the tradeable information sector and outlined the impact that modern technology would have upon them. We wish now to set that sector in a wider framework and to examine its current and potential importance for the UK economy.

3.2 Some commentators have found it convenient to analyse business activities related to information handling by two criteria – first the extent to which they involve the supply of a physical product or, alternatively, an intangible service; secondly, the extent to which that product or service has value because of the content of what is supplied or because of what it enables the recipient to do. Thus the production of a pre-recorded video cassette, for example, results in a physical product whose value lies in its content. Conversely, the provision of a telephone service is an activity which enables communication to be established between two people. We have found this a helpful analysis and Figure 1 indicates, in diagrammatic form, where some activities related to information supply and transmission fit into this framework.

3.3 Clearly, some activities straddle sector boundaries – it would be foolish to suggest that the creation of a broadcast programme that is subsequently sold as a video cassette is a fundamentally different activity from the creation of a programme that is not marketed in that form. And more comprehensive presentations of this form of analysis include such subtleties. But even from the very simplified presentation of Figure 1 it can be seen that the main policy initiatives so far in IT have concentrated essentially on the lower left-hand quadrant, with some extension to the telecommunications aspects of the lower right-hand quadrant, and there has been, by comparison, very little attention paid in policy terms to the upper half of the diagram (with perhaps the exception of cable services). The aim of this report is to remedy that situation.

3.4 For there are obviously substantial policy issues in all four quadrants. To

Figure 1: Structure of the Information Business


Content
Creation of packaged software
Film/video production
Printing/publishing
Database creation
News agency
On-line data service
Broadcasting
Non-interactive cable services
Creation of custom software
Products
Services
Manufacture and supply of IT equipment – computers, terminals, telecommunications networks, TV sets etc
Interactive cable services
Telecommunications
Post
'Enabling'

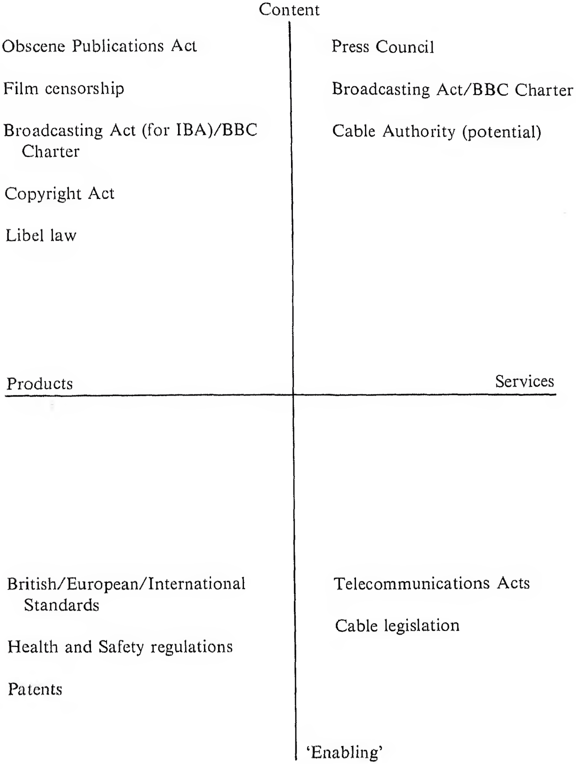
illustrate this, Figure 2 uses the same criteria as Figure 1 to classify some of the relevant legal and other regulatory influences on information activities. The picture is complex; the different laws and regulations have developed in large measure independently over the years – yet their interactions are clearly a major determinant of the environment in which information services, and their associated hardware and telecommunications supply industries, operate.

3.5 It is not easy to assess the current economic importance of the tradeable information sector, as outlined in Chapter 2 and illustrated in Figure 1. The picture is confused, first by the inclusion in many statistics of information handling activities which fall outside our definition (banking, insurance, etc) and secondly because the hardware supply and telecommunications industries obviously serve not only these activities but many others, often with the same equipment, and it is almost impossible to separate out their contribution to tradeable information activities. Nevertheless, some general points can be made and some approximate estimates derived.

3.6 First, information handling in all its forms is undoubtedly of growing importance to the economy. The decline in the proportion of the population employed in agriculture and the extractive industries, the rise and recent fall in the numbers employed in manufacturing, and the steady growth in the service sector, are well documented. Tables 1 and 2 set out a few relevant figures. Moreover, within the manufacturing sector, the importance of information handling has increased; the proportion of people employed on the shop floor, compared with those engaged in management, sales, purchasing etc has declined (Table 3). We believe the same trend to have occurred in service occupations also. The 1981 Census data that would provide a national figure for the proportion of the working population concerned with handling information is not yet available, but examination of previous census results indicates that the national proportion is likely to be 40–45%.

3.7 That provides the widest framework in which to set the tradeable information sector. It is right to make reference to the totality of information handling activities since they are all potential customers for some tradeable information services – banks employ on-line financial services; educational establishments need access to scientific and technical literature; central and local government are extensive users of computers and require appropriate software, etc. Unfortunately it is not possible to gauge with any precision the present size of the tradeable information sector; official statistics do not allow the identification of the sort of activities referred to in Chapter 2, except in a few cases, eg printing and publishing. Our best estimate is that of the order of one million people are currently employed in tradeable information activities.

Figure 2: Regulation of the Information Business


Content
Obscene Publications Act
Film censorship
Broadcasting Act (for IBA)/BBC Charter
Copyright Act
Libel law
Press Council
Broadcasting Act/BBC Charter
Cable Authority (potential)
Products
Services
British/European/International Standards
Health and Safety regulations
Patents
Telecommunications Acts
Cable legislation
'Enabling'

This makes it comparable in employment terms with the construction industry, or three times as large as agriculture, forestry and fishing.

3.8 The same deficiencies apply to GDP statistics. Neither the contribution of information-handling activities in total, nor the turnover of the tradeable information sector and its constituent parts, can be derived from official figures. In particular there is no analysis of the service sector comparable in detail to the Census of Production figures for the contribution to GDP of the production of physical goods. This general situation is a grave defect if, as we believe, information is to be an important element of future economic activity and international trade. It prevents proper analysis and forecasting. The most that can be said is that the tradeable information sector, based on our estimate of employment, probably accounts for about 5% of the GDP, ie twice the contribution of the electrical engineering industry.

3.9 The UK's comparative advantage in this form of activity may, though, be illustrated from trade figures. While in no way providing a detailed analysis of relevant trade flows, these do contain a heading 'other services' which broadly speaking include the activities that we discuss in this report. Financial services (banking, insurance etc) are excluded, while consultancy earnings, computer services, etc are included. The significant feature of our trade in these services is the positive balance, which has grown from £0.4 billion in 1971 to £2.5 billion in 1980. During the same period, the balance in manufactured and semi-manufactured goods rose only from £3.0 billion to £5.5 billion. Thus, while the absolute rate of growth in gross overseas earnings was similar for the two categories, the net contribution of 'other services' to our balance of payments rose from 13% of that of manufactures and semi-manufactures, to 46%. It is clear that, in world terms, the UK has greater comparative advantage in these types of activity than in the production of manufactures.

3.10 None of this, of course, is meant to belittle the place of manufactures in our exports; they are currently a much larger source of gross overseas earnings than services, and should continue to be so. What we would argue, however, is that due attention paid to these areas where the UK has demonstrated its ability to compete effectively is likely to result in even greater returns in the future.

Table 1: Employment in the UK by industry

Thousands

	1901	*1961*	*1981*
Agriculture, Forestry and Fishing	1,457	710	360
Mining and Quarrying	937	727	332
Manufacturing			
Food, drink and tobacco	917	793	632
Chemicals, coal and petroleum products	147	499	432
Metal manufacture	1,569	643	326
Engineering and allied industries		3,654	2,739
Textiles, leather and clothing	2,681	1,444	707
Rest of manufacturing	809	1,508	1,202
Total manufacturing	6,123	8,541	6,038
Construction	1,219	1,485	1,132
Gas, electricity and water	62	389	340
Services			
Transport and communication	1,436	1,678	1,440
Domestic offices and personal services	2,344	—	—
Commercial occupations	673	—	—
Distributive trades	—	2,767	2,635
Insurance, banking and finance	—	684	1,233
Professional and scientific services	674	2,124	3,695
Miscellaneous services	—	1,819	2,414
Public administration	396	1,311	1,579
Total services	5,523	10,383	12,996
Other occupations	962	—	—
Total employment	16,283	22,234	21,198

(Source: Department of Employment)

Table 2: Employment in the UK by industry

	1901	*1961*	*1981*
	%	%	%
Agriculture, Forestry and Fishing	8.9	3.2	1.7
Mining and Quarrying	5.8	3.3	1.6
Manufacturing	37.6	38.4	28.5
Construction	7.5	6.6	5.3
Gas, electricity and water	0.1	1.8	1.6
Services	33.9	46.7	61.3
Other occupations	5.9	—	—

(Source: Department of Employment)

Table 3: Employment in the UK in manufacturing industry: percentage of workforce in non-manual occupations

	1961	*1981*
Manufacturing	%	%
Food, drink and tobacco	19	24
Chemicals, coal and petroleum products	34	38
Metal manufacture	19	25
Engineering and allied industries	26	34
Textiles, leather and clothing	13	17
Rest of manufacturing	21	28
Total manufacturing	22	30

(Source: Department of Employment)

4 On-line services

4.1 In this chapter we consider in more detail the current state of one part of the tradeable information sector, the provision of 'on-line' information. We have chosen this activity because it relies entirely on IT (there is no 'conventional' equivalent), because it is a rapidly expanding area and because it illustrates some of the main factors that have to be taken into account in developing new information services.

4.2 In an on-line service, users interact through terminals with a computer that holds the information required on a 'database'. The terminals may be far distant from the computer; many services available in the UK are based upon computers in the USA, connections being established through satellite communications links. The computer is referred to as the 'host' for the database. The 'host-organisation', ie the company operating the computer, may be quite distinct from the organisation compiling and maintaining the database, which is normally referred to as the 'database producer'. In more familiar terms, the host is the retailer who markets the products of others – but examples of 'own label' services also exist.

4.3 The subjects covered by on-line databases are many and varied, but fall into a number of categories. The longest established are databases of scientific and technical literature, with more than 300 such databases now available in the UK, varying in size from Chemical Abstracts, produced in the USA by the American Chemical Society, with over five million entries, to very small databases with as few as 10,000 entries. Prominent UK databases include INSPEC, the database of abstracts in physics and engineering, produced by the Institution of Electrical Engineers (two million entries) and World Patent Index, originally produced by Derwent Publications. Each database is normally available on several hosts, just as the same goods will be available in different shops; the hosts compete in the structure and level of their charges. Some hosts, though, have come to dominate the supply of scientific and technical literature. Lockheed Dialog, based in California, has more than 200 databases mounted on its computers and other American services are well established. Their success has been founded upon the large demand for technical information arising from major research programmes, eg for defence and space projects. Within Europe, Euronet-Diane has been founded by the European Community, with the European Space Agency being a major host. UK hosts are less in evidence, but Pergamon-Infoline are currently aiming to establish a significant UK presence in this area.

4.4 Legal databases, covering statutes and other legislation together with court reports and other legal information, form a second category. Such information has similar characteristics to scientific and technical information, in that it may be classified by subject, date, nationality etc and, once introduced into the database, is not in general changed (although statutes are, of course, amended from time to time). There are two services; one is Eurolex, covering UK and European law, regulations and case reports, and is produced by Thomsons. The other is Lexis, for which Butterworths provide the UK part.

4.5 Financial services form a further major category. These provide both up-to-the-minute information on share prices, currency rates, etc and historical information on such subjects, the performance of companies, commodity prices, and economic data about the UK and other countries. Prominent are the services provided by Extel, Datastream and Reuters. These and other services are used extensively by the financial community and the current growth in business may be illustrated by Datastream whose turnover rose from £6.9 million in 1981 to £8.3 million in 1982, with profits of £0.85 million and £1.43 million respectively. The Reuters service is particularly notable, since it combines financial information with dealing services, thus enabling subscribers to carry out their business at the Reuters screen. To do this, it employs a specially designed terminal. Reuters' success was reflected in their 1982 results, which showed a profit of £36.5 million on a turnover of £180 million.

4.6 These firms are not only prominent in the UK, but also around the world. Extel, for example, have a major part of the world's business for share price information. They illustrate the success that can be built upon a perceptive identification – first, of the market for specialised information and secondly of the potential of IT for supplying that information.

4.7 A fourth category of on-line databases is now developing out of news services. Major newspapers, such as the New York Times and Financial Times are making their copy available in this way. The database may be searched by means of keywords (the normal method of locating information) for the item desired. A significant recent development was the launch of the World Reporter Service, operated by Datasolve but supplying material from the BBC's monitoring of foreign news broadcasts, up-dated daily. It also includes the texts of World Service news broadcasts. This service therefore provides current information about overseas countries backed by the BBC's reputation for accuracy and impartiality, one of the UK's prime assets in the information business.

4.8 A variation on the 'news service' database is POLIS, the Parliamentary On-Line Information System. This provides information on Parliamentary business, debates, questions, statements, etc, and enables questions such as 'which questions have been asked in the past year on Government support for computer suppliers?' to be answered rapidly. The information is input daily by members of the House of Commons Library and held on a computer at Milton Keynes operated by Scicon. It is available to non-Government users.

4.9 Finally, there are the databases on Prestel, the public viewdata service operated by British Telecom, which taken together form a fifth category of a general database. The individual information providers on Prestel (except for the general news services) contribute information on particular subjects but collectively they provide a wide range, from rail timetables to commodity prices. Prestel has had a much slower start then its originators hoped for, but even so is the largest on-line system in the UK with more than 20,000 subscribers and 220,000 pages of information now available.

The future scene

4.10 Reliable figures for the size of the UK or European markets for on-line activities are hard to come by. One estimate reports the European market for such services as about £80 million in 1980, rising to over £900 million in 1985. Another suggests £120 million in 1981 and over £400 million in 1987. The uncertainty is large and UK figures are similarly obscure. There is general agreement, however, first that there is a high rate of growth in such services and secondly that the financial and business community is the main market, providing more than half of the total revenues. It is in financial and business orientated services that UK firms have been most successful. Scientific and technical information is some 10% of the total.

4.11 We expect on-line services to grow rapidly and to cover new areas of information supply. We therefore make some observations below on the factors that affect the creation and growth of on-line services, and on their implications.

4.12 First, technology alone will not sell an on-line service. The experience of Prestel has shown that neither the general public nor business will pay for information supplied by a new technology system unless it offers clear advantage over traditional supply methods. Those companies that have employed Prestel extensively, most notably travel agents, have done so because it offers permanently-updated information combined with a convenient way of transacting business. There has, in other words, been a saleable 'package' for the travel community. This concept of a package is applicable to many information services. New information services must therefore meet a perceived need in a well-structured manner.

4.13 The failure of Prestel's initial unstructured approach, in which BT merely offered a new communications channel to a multiplicity of information providers, showed that the novelty of a screen was not sufficient. A selective approach has now been adopted by Prestel in their latest marketing moves, which are in the form of joint ventures. One of these is Club 403, a closely monitored project supplying news, information and other services to 2,000 subscribers in the West Midlands. Micronet 800 is another Prestel package aimed at users of personal computers; it supplies software and computer services. Another is CitiService, providing a shop window on worldwide financial and stock market information.

4.14 Secondly, much information at present comes free, or apparently free, and a small charge is sufficient to deter users. The charging structure of Prestel made access to railway timetables appear expensive by comparison with looking at a printed timetable or telephoning a station. Users do not value their time, and are accustomed to the free information services provided by public libraries. Electronic information normally has a charge attached to it and will only become widely used when either such charges are hidden or the concept of information as a valuable commodity, with a cost attached, is more deeply implanted.

4.15 Thirdly, the creation of a database is an activity comparable to writing a book; there is a heavy initial investment. The on-line business is sufficiently new for some parts, eg the supply of scientific and technical information, still to have only marginal commercial viability. In these circumstances, some governments have provided extensive subsidies for the creation of databases, in part as a defence against the domination of overseas information suppliers. France particularly has adopted such a policy. Whether or not this factor enters policy considerations, some investment assistance from Government may be needed and we welcome the Department of Trade and Industry's willingness to regard databases as a 'product' for this sort of support.

4.16 Databases also need maintenance, and in the case of scientific services, or those that provide historical runs of business or news information, those first in the field have a major advantage. The need to input all the back information in order to make the database comprehensive adds greatly to the initial investment. The importance of identifying new market opportunities and then moving quickly is paramount since by such a process complete dominance of a market sector may be achieved.

4.17 Fourthly, there will be implications for present methods of publishing information. For example, the British Library is sponsoring BLEND (the Birmingham and Loughborough Electronic Network Development), an experiment to see how 'electronic journals' might operate. In such a journal, the author, referees, editors and readers communicate totally electronically, through terminals linked by electronic mail facilities. With word-processors becoming increasingly common, and increasingly able to communicate, such a journal is feasible. Were electronic journals to become widespread (they would in effect be full-text, on-line information services), they could remove much of the market for printed publications in the field of scientific and technical literature. It is, of course, not necessary to go to the full electronic journal to have this effect; the availability of text (however produced and edited) accessible by electronic means – stored, for example, on optical discs – could inhibit sales of printed material.

4.18 Finally, institutional arrangements may inhibit the development of new markets. Universities, for example, are most unlikely to have information service budgets even though they allocate funds to libraries. And research grants do not in general make such provision. The problem may be even more acute in schools, where the linking of a micro-computer to the telephone line may cause a substantial rise in the telephone bill. The development of new aids to education and research may require adjustment to budgetary and administrative procedures.

4.19 The same considerations apply to Government. We consider Government's role in developing information to services in more detail in the next chapter but comment here about its position as a user of on-line services. Government accounting procedures recognise staff costs and telecommunications costs, but find it difficult to trade one against the other. Moreover, the most obvious effect of the use of new information services is a rise in the costs of Government; their contribution to raising the efficiency of administration or the quality of decision-making is much less tangible. Government does not appear, therefore, to be making as much use of on-line services as it might. But with a change of approach to the identification of benefits it could provide a substantial market.

Technical aspects

4.20 On-line services employ complex software to organise the database and to enable users to locate individual items. There are two major problems with current services. First, they vary in their procedures; thus users who wish to work with more than one service need to learn new identification and search procedures. Secondly, they impose a rigidity in the way that enquiries may be formulated, owing to the need to make enquiries comprehensible to the software system. The development of improved search procedures is highly desirable. Such developments could build upon existing UK expertise, such as that at AERE Harwell which led to STATUS, a widely-employed software system for databases. There is need for greater uniformity of approach, and simplification, so that users may be able rapidly to learn the search procedures for different databases, and for less formal modes of enquiry, enabling questions to be posed in a closer approximation to normal language. This development could come from the work on Intelligent Knowledge-Based Systems (IKBS) to be funded through the Alvey programme.

4.21 Just as software procedures vary extensively, the hardware (terminal) requirements of different services also vary. Some services, indeed, employ idiosyncratic hardware as a deliberate policy. By renting out terminals, they can ensure an income irrespective of level of usage. However, as on-line services grow, users will not wish to be surrounded by a multiplicity of terminals. The future, we believe, must lie with universal terminals, so that a single terminal will give access to all the databases to which the user has subscribed. There may of course be specialist needs which require special equipment, but the development of common technical standards to define the characteristics of the information flow in on-line services seems to be an essential stage in their future development. Paradoxically, the declining cost and increasing capabilities of microelectronic devices renders the need for a single standard less important (since conversion of information flows between standards becomes economical) at the same time as the need for recognised standards grows. Thus we do not envisage a single standard, but a small number, each suited to different types of information.

4.22 On-line services rely on telecommunications links, and some people engaged in the provision of these services have claimed that the UK's high (by international standards) telecommunications charges and distance-dependent tariffs have inhibited the growth of on-line services here. Whatever the balance of argument, two developments will alter the future pattern of the telecommunications links. First, packet switched services are being introduced. These should, if tariff levels are correctly set, provide a stimulus to on-line services through lower, distance-independent charges. Secondly, cable systems will potentially offer low-cost access to databases and, as we pointed out in *Cable Systems*, will lead to the development of different types of on-line services.

Representative bodies

4.23 We conclude this chapter with a note on the present structure of representative bodies in industry, since these are responsible for making the on-line industry's views known to Government at a critical stage in its development.

4.24 United Kingdom organisations include the Association of Database Producers, the UK On-line Users Group, and the Videotex Industry Association. The interests of the first two bodies are biased towards the scientific and technical end of the spectrum, those of the third being focussed on Prestel. Representative groupings of financial and business services are not evident. Aslib, which is a grouping of information management interests, is also active in the scientific and technical on-line field, and provides accommodation for the On-line Information Centre, which operates with financial support from the Department of Trade and Industry and the British Library R & D Department. The Centre exists to advise and assist UK on-line users and publishes a newsletter, On-line Notes. The Institute of Information Scientists is attempting to raise awareness of the value of information and to establish professional standards. The Library Association clearly also has interests in this field.

4.25 Some of the above organisations have combined with other interested bodies in the Joint Consultative Committee (Aslib, SCONUL, Library Association, Institute of Information Scientists and Society of Archivists) which attempts to develop a joint view on subjects of common interest and make them known to Government. There is also a small informal grouping, the British Information Round Table, whose participants additionally include the suppliers.

4.26 In a European context, the European Information Providers Association (EURIPA) represents European database producers, on-line and timesharing services, and aims to influence the policies of European governments, to identify new market opportunities, and to provide a discussion forum. The European Association of Information Services (EUSIDIC) is an international grouping of database producers, hosts, on-line users, and others interested in handling, producing and disseminating information in electronic form. The European Host Operators Group (EHOG) has been formed by the information centres providing on-line public access over Euronet and other telecommunications networks and aims generally to further the aims of the European on-line information industry.

4.27 The potential for overlaps and confusion, both within the UK and on a European basis, is evident. In the final chapter we suggest that a more rational structure is needed.

5 The roles of Government

5.1 The private sector must clearly bear the main responsibility for developing information supply as a business activity. But the influence of Government is not insignificant and since we as an Advisory Panel have been established primarily to advise the Government, we discuss in more detail here the various ways in which Government participates in or affects the tradeable information sector and indicate some areas requiring policy attention.

5.2 In essence, Government has four principal roles in the information business:

i. it establishes the legal and regulatory framework in which firms operate;

ii. it is the largest information handling organisation in the country, and a major information supplier;

iii. it can act as a national focus, both for national purposes and in order to represent UK views in international negotiations;

iv. it can provide direct financial support for technical developments and other commercial initiatives.

Legal and regulatory framework

5.3 Figure 2 in Chapter 3 demonstrated the wide range of statutory and other regulatory controls over different aspects of information supply. It is clearly important, when amendments are proposed, for the interaction of these controls to be recognised and due attention be paid to potential technological and commercial developments.

5.4 Of the legislation now under active consideration, we would single out the revision of the Copyright Act 1956 for special mention. The Green Paper

(Cmnd 8302) issued in 1981 on this subject followed the report of the Whitford Committee (Cmnd 6732) in 1977. While recognising the complexities of the subject, this timescale hardly suggests that the Government is giving it high priority. Yet copyright law underpins the commercial viability of most of the services considered in this report. The recent concern about the unauthorised copying of video-cassettes, which threatens to destroy the legitimate business of major firms in the entertainment industry, serves to illustrate this point. A further example, in a more traditional activity, is the current pirating of English-language textbooks in the Far East, which is undermining the market for UK publishers in some developing countries. Copyright legislation, well drafted and effectively enforced, overseas as well as in the UK, is thus one of the main foundation stones of the tradeable information sector.

5.5 This is not the place to comment in detail on the proposals in the Green Paper. Our concern is that the eventual legislation, while maintaining a balance between the interests of users and suppliers of information, should nevertheless provide a framework in which new information services exploiting new technology can easily develop, with clearly defined ownership of the intellectual content of the information supplied. We suspect that this may require a shift towards the interests of the supplier, as compared with the present Act. Moreover, the legislation should be able to accommodate future technologies and services so that it is not out-dated by rapid technological developments and it will be important for Government and Parliament to have available the best possible technical advice on this point. We comment in passing that the Green Paper's proposals on the protection of computer software did not seem to us to cover all the needs of software suppliers and users; this gives emphasis to our concern about the advice required in the preparation of this legislation.

5.6 Telecommunications legislation has obvious relevance to the tradeable information sector since many new methods of information supply rely on telecommunications services. Recent legislation has radically changed the institutional structure of telecommunications services in the UK and opened the way for competition both in the supply of services and associated terminal equipment. Yet despite the advent of Mercury, British Telecom will continue to dominate the telecommunications market in the UK for the foreseeable future. The way that the proposed Office of Telecommunications chooses to exercise its regulatory responsibilities will have a critical influence on the telecommunications element in new services. The development of IT-based information services in the USA has been advanced by relatively low telecommunications charges and by the information suppliers' ability to combine telecommunications and information charges in one invoice. These features are only now becoming available in the UK. It will be important, therefore, for the Office of Telecommunications to consider these and other influences on the development of information services and to provide a telecommunications regime that will maximise the opportunities for new commercial initiatives.

5.7 We commented in the previous chapter on the need for technical standards. We believe that the future must lie with widely accepted national and international standards for organising and presenting data and commend the attention now being given, through the Focus Committee of the Department of Trade and Industry, to the technical standards required for information technology systems. We welcome the committee's work, and associated initiatives such as the 'Hermes' demonstration project for teletex. We see a major area of application for such standards in the new interactive services that we hope will be developed on wideband cable systems.

5.8 Not all standards, of course, relate to technology. Standards for the organisation and presentation of information and data can be equally important in some areas. The Government, through the British Library, and the British Standards Institution can and should take a leading role in their development.

Information processor

5.9 Almost all the business of Government is concerned with information processing. Government takes in, manipulates and puts out vast quantities of information. Much of this information lies outside the subject of this report; the tradeable information sector does not, for example, include tax returns or social security records. But some of the Government's output does (or at least could) fall inside this sector, and the manner in which Government both takes in and gives out information influences the environment in which private sector information services operate.

5.10 To take first the input side, many organisations have to make periodic returns to Government. They include banks, building societies, local authorities and private companies. The extent to which Government is prepared to accept this information in machine-readable form – by magnetic tape, floppy disc or directly from one computer to another, for example – will influence the extent to which the basic information is handled in that form both in the originating organisation and in Government itself. This again will influence the ability of banks, firms, etc, to take in other information in similar form from external information services.

5.11 Various initiatives are now under way within Departments to assess the potential for the application of IT. Some are associated with the Rayner scrutinies. In making these assessments, Government needs to bear in mind not only the direct effect on its own administrative processes, but also the opportunities opened up for interacting with outside bodies in different ways, thereby encouraging greater efficiency and new services in non-Government organisations.

5.12 Turning now to the output side, Government is a major – and often unique – source of information. It produces many reports and series of official statistics. It possesses huge repositories of information, some of which (the Public Records Office and Companies House, for example) are accessible to the public. It issues press releases to put over its point of view. Parliament, through Hansard and Committee reports, is another important source of information closely connected with Government.

5.13 As with the input side, the way in which this information is issued can strongly influence the development of new services in the private sector. The provision of official statistics on viewdata, for example, could add significantly to the attractiveness of a viewdata service. Conversely, the production by Government of a free publication on a particular subject could render unviable a commercial service which is charging for the same information.

5.14 Almost all Government publications are in paper form, many issued through HMSO. But a number of Government Departments have frames on Prestel, and the Central Statistical Office is issuing some statistical series in machine-readable form. The Parliamentary On-line Information System (POLIS) is another valuable initiative. These are early signs of an awareness of new information media. We consider, however, that much more could be done. To take one example, we regard the information held at Companies House as suited to on-line access, perhaps through viewdata. There would, we think, be many potential users in the accountancy and legal professions who would prefer to pay a small charge for an on-line search rather than go through an agent or make a personal visit to one of the search rooms. This sort of initiative, whether organised by the Department itself or through a joint venture with a private sector partner, should be sought by all Departments with stocks of information for which there is regular public demand.

5.15 The introduction of new methods of handling and distributing information is, of course, not without its problems. One of the most basic is that it makes the definition of a publication somewhat hazy. When a database is continually being up-dated, what is the definitive publication which should be lodged with the British Library? There are growing archival and cataloging problems. Secondly, and quite apart from electronic distribution, the ease with which text held in electronic form may be turned into print, without use of traditional printing processes, means that Departments can more esily act as their own publishers. This again weakens bibliographic controls and can make the location of publications harder for potential users.

5.16 But such problems must be faced and overcome. The growth of such 'grey' literature is a recognised phenomenon and steps are being taken to establish a database to record at least some of the 'grey' publications in Europe. Suitable procedures must be established to ensure both the full utilisation of modern distribution media and the presence of adequate bibliographic controls.

National focus

5.17 Government is the national point of focus for some policy issues affecting the tradeable information sector. This is most clearly the case for those issues that involve the policies of other countries, but there are domestic examples also.

5.18 On the international side, Government participates in many negotiations relevant to our subject. We have already pointed out the importance of copyright law; international copyright agreements are the responsibility of UNESCO and the World Intellectual Property Organisation (WIPO), a body under United Nations auspices on which sit UK Government representatives. The General Agreement on Tariffs and Trade (GATT) has a potential interest in international trade in information. There are pressures for restrictions on trade in information services. Some of these (notably from Third World countries) arise from fears of cultural domination, others stem from more traditional protectionist arguments. We believe that it is in the UK's interest to resist such pressures and to seek to maximise freedom of international trade in information.

5.19 Other important negotiations take place in such organisations as the International Telecommunications Union (ITU), the European Community and the Organisation for Economic Co-operation and Development. In all these, whether establishing international agreements on telecommunications tariffs and services, or codes of practice for the transmission of data, our negotiators need to keep in mind the interests of the expanding tradeable information sector and to minimise barriers to international access to UK services.

5.20 Another aspect of this focus role of Government is that only Government can assess the national interest in such matters as the UK's vulnerability to disruptions of information supply. In Chapter 4 we pointed out that many databases, although created and maintained in the UK, were 'hosted' on overseas computers. There have been instances in the recent past when pressure has been brought to bear by the host's government to cease information supply to certain countries, because of political considerations. While no serious effects of such moves have been recorded, it is clear that this situation not only prejudices the ability of UK organisations to market their databases, but potentially denies the UK access to information originated here. And the point applies with even more force to databases that are both created and held overseas. Only Government can assess the balance of risks and, if it so judges, make appropriate alternative arrangements.

5.21 Finally, Government co-ordinates the national effort for international or domestic projects to demonstrate the use of new technology or to help establish technical standards. We have already referred to Hermes, which is a pilot project in remote document delivery, employing teletex. A further example of Government's co-ordinating and catalystic role is the recently-announced Club 403 on Prestel, which we referred to in Chapter 4. This exercise has been orchestrated by the Department of Trade and Industry. International projects of this nature also occur; one example is INSIS, a system by which national government offices in all member states of the European Community will be able to communicate with the Commission and with each other. Government has stimulated and co-ordinated the input of UK firms.

Financial support

5.22 Government, notably through the Department of Trade and Industry, has many methods for assisting with the costs of launching new products. These in general fall within the Support for Innovation Scheme. In addition, it can stimulate awareness through suitable financial outlays, as it has done for IT in education through the 'Micros in Schools' schemes. The mechanisms are therefore in place for Government financial assistance to new ventures but the emphasis has traditionally been on hardware. What is now needed is an appropriate breadth of scope, so that new service ventures in the tradeable information sector may be supported. The support available for computer software shows that no new principle is involved and the Department of Trade and Industry's desire to stimulate the supply of educational software is welcome. The creation of an information service often involves substantial launch costs and it will greatly assist the development of the tradeable information sector if Government support is as available for new ventures in this sector as in more traditional manufacturing activities.

6 Conclusions and proposals

6.1 In previous chapters, we have outlined the significance of information as a tradeable commodity, indicated the technological developments which are affecting those who provide or use information and discussed the UK's position in the world's information markets. We have shown that the handling of information accounts for an ever-increasing proportion of economic activity and that the supply of information – whether in the form of education and training, share prices, news reports, journal articles or whatever – is an area of major commercial importance with high growth potential.

6.2 Our primary conclusion, therefore, is that both private and public sectors in the UK need to pay much more attention to information as a commercial commodity, to be concerned with the creation and maintenance of its value, and to take steps to develop the delivery systems that best meet users' needs. The nation has over the past year become much more aware of the significance of IT – in part because of the vigorous promotional efforts initiated by Government – indeed the very existence of the Panel is a consequence of the Government's recognition of the importance of IT. Emphasis has, very rightly, been placed on the devices associated with IT – the fibre optics, home computers, advanced telephones, etc – and their capabilities. That has introduced people to potential applications. Now there needs to be a complementary element in Government and company thinking, for equipment is only as valuable as the information that it handles. We hope that this report is a contribution to that change of emphasis. Its message for both Government and firms is that the technological changes that underlie IT are bringing together hitherto disparate activities – for example publishing, film and video production, and the creation of computer software – to create a powerful new economic sector, the tradeable information sector. Firms therefore need to examine carefully their current businesses to see what links they should be making within that sector, while Government in its policies needs to recognise the network of interlinked developments that have been discussed in this report and to stimulate a greater UK presence in this growth sector.

6.3 For this country should have a major presence; the information business suits the British capacity for original, creative work, as demonstrated by Nobel Prizes on the one hand and Academy Awards on the other. It exploits our natural command of the English language, the principal language of commerce and of science and technology, and the first or second language of virtually all the world. It can be founded upon Britain's well-established reputation for impartial reporting and unbiased advice, as demonstrated by the prestige of the BBC and the success of our consulting firms.

6.4 We are not the first to point out the significance of information supply for future economic health. The ACARD report 'Technological Change: Threats and Opportunities for the United Kingdom' (HMSO, 1980) pointed out the importance of service activities that utilised IT and recommended that more effort be devoted to developing these services. That report also drew the connection between the supply of services and the supply of associated hardware, commenting that the combination of the two enhanced the sales prospects for both, a view we endorse. Thus the development of the information sector should have considerable benefit for UK hardware suppliers if they can produce the right equipment.

6.5 In subsequent paragraphs we suggest various measures which we believe will stimulate and strengthen this sector of the economy, and enhance the position of the UK in world markets for information. We preface these with three general *recommendations*:

> First, as we have already indicated, Government should recognise the current economic significance of the tradeable information sector, and the opportunities for future growth, and take its interests into account in policy formation.
>
> Secondly, those already active in information supply – in publishing, broadcasting, film-making etc – should closely examine their present activities to identify how new technology is eroding the previous distinctions between their particular interests and others with which they may previously have had no contact, and should prepare business strategies accordingly.
>
> Thirdly, those wishing to stimulate or participate in new business activities should note the many opportunities now being opened up through the use of new technology for the supply and analysis of information, which are suited to an entrepreneurial approach.

6.6 The proposals that follow are addressed mainly to Government, in part because our role as a Panel is primarily to advise Government, in part because Government has more opportunities for coherent action than the great numbers of firms that make up the private sector element in the information business. But the principal responsibility for exploiting the opportunities opened by new computing and communication technologies must rest with the private sector, and if this report serves to stimulate a re-appraisal by appropriate firms of their position in the world's information markets, it will have served a valuable purpose.

Organisation

6.7 We have at present a fragmented UK information industry interacting with a fragmented set of Government responsibilities. The development of greater coherence and purpose in the national effort in this area requires corresponding institutional changes.

6.8 On the private sector side, we see a need for an umbrella representative trade body, which we will call the Information Industries Association (IIA). This body would bring together the various trade and professional bodies now attempting to develop a group consciousness and to make group views known. These bodies would, of course, retain their individual interests, but major issues affecting all participants in the information business – concerned, for example, with international trade in services, the protection of intellectual property, the structure and level of telecommunications tariffs, the availability of Government information, technical and bibliographic standards, etc – should be handled by a better resourced, more comprehensive body. We hope that one of the existing trade groupings will expand its role to cover the range of issues indicated above, and that Government will encourage this process by indicating that it would welcome receiving views from such a comprehensive trade body and would actively seek to co-operate with it.

6.9 There will, inevitably, be residual differences of opinion and friction points among existing bodies, as well as genuine differences in the commercial objectives of member firms and organisations. But those represented on these bodies ought to be able to recognise the mutual benefit to be derived from a strong, wide-ranging, representative body able to promote the development of the industry as a whole.

6.10 Should such an initiative not come from within the industry, a Government Department or NEDO should call interested parties together. Indeed, NEDO should in any case consider the establishment of a Sector Working Party for this area of business activity. This would strengthen its SWP structure in the service sector in a field closely linked with existing manufacturing SWPs.

6.11 On the Government side, the pattern of responsibilities is complex indeed. The Department of Trade and Industry has sponsorship responsibility for suppliers of IT hardware and computer software, and for aspects of scientific and technical information services. It also sponsors the printing, publishing and film production industries and has developed a recent interest in educational software. On the regulatory side, DTI is responsible for the regulation of telecommunications, including the radio-frequency allocation functions previously administered by the Home Office, and for policy on copyright and trade in services, including international aspects. As for other Departments, the Office of Arts and Libraries looks after library policy and such aspects of information services as fall outside other Departments' responsibilities. The Home Office has responsibility for broadcasting policy. The Treasury, Central Computer and Telecommunications Agency and Management and Personnel Office all have interests in Government's handling of information, the systems by which it is handled, and the conditions under which it is made available. HMSO is the Government's publisher, and the Central Office of Information and Departments generally provide vast amounts of information to the media and the public.

6.12 It is quite clear from this catalogue that there is no Department with overall responsibility for considering the development of the tradeable information sector, and providing an environment in which the sector can flourish, although the new Department of Trade and Industry contains most of the necessary functions. If the commercial supply of information is as significant to the future health of the UK economy as we believe it to be, such a responsibility must be recognised within Government. At present, the private sector does not know where to turn for guidance on policy or where to address views and proposals. We therefore see three needs: first, for effective Government machinery, whether within one Department or of an inter-Departmental nature, to consider in an integrated manner the issues raised by the growth of information services and the technical developments that underpin them; secondly, for clear Ministerial commitment to the importance of this area and corresponding priority in policies, and thirdly, for one major Department to have responsibility for the co-ordination of policy in the area and to be the principal point of contact between Government and private sector interests.

Policy considerations

6.13 In reviewing the policy issues that need to be addressed, we would give prominence first, to the stimulation of the UK industry through the release of Government-held information, and secondly to the protection of the commercial value of information.

6.14 We commented in a previous chapter on the role of Government as an information processor. Government holds for its own purposes huge stores of information – company records, statistics of all sorts, patents and trademarks, among others. It also supplies vast quantities of news and current affairs information to the media generally. We believe that the appropriate exploitation of these information sources for the benefit of the UK information business should be an explicit policy objective. This is in effect the corollary for information supply of public purchasing policy. While the principal function of an activity, for example the keeping track of companies, or the explanation of policy, or whatever, should of course be fulfilled, it should be carried out in a manner that helps to promote new types of information services. This means, for example, that company information should be available on-line, perhaps via viewdata, or that press releases should be distributed by electronic means (which would, incidentally, enable them to be distributed more quickly). Government should seek links with appropriate private sector organisations to develop these new types of service. Its information is often unique, and much wanted. There are opportunities for mutual benefit.

6.15 Secondly, non-transient information requires protection. Copyright legislation is a fundamental building block in the infrastructure of the information business. The Copyright Act 1956 is now under revision; the Department of Trade and Industry is considering the many submissions received in response to its Green Paper of 1981. We will not comment here on that document; the subject is highly complex, and we could not do it justice. But what we would stress is the crucial importance of copyright legislation to future economic activity. It is essential that the Bill now being prepared should take account of the web of developments that we have described in the report in order to provide a secure legal foundation for the information business to the year 2000 and beyond and we urge all interested parties to give the subject close and continuing attention.

6.16 As for other aspects of Government policy, we suggest that the following require continued attention:

i. international trade in information. The UK's interest lies in a free market for trade in services; protectionist tendencies, here or overseas, should be resisted;

ii. procedures for obtaining information from principal suppliers. An increase in the use of machine-readable data would not only improve the efficiency of information handling within Government, but would aid the provision of processed data through IT-based systems;

iii. the promotion of technical standards – teletex, LAN standards, etc – through the supply of Government information and the funding of demonstration projects. In particular, we see a need for new, easily understood procedures for accessing databases which could be applied to a wide variety of databases. Viewdata has shown how simple database access can be, but a more versatile procedure, allowing more complex database structures to be employed, would greatly assist the development of on-line services. Such a procedure could be promoted by employing it to access Government information;

iv. the development of advanced software for searching databases. Present command structures are not easy to assimilate by casual users, who we believe are the future market. As databases serving on-line systems cover more subject areas and have to store more types of information, corresponding software developments will be required. This will include developments in the use of 'relational' databases, which give great flexibility in applications, in content-addressable database systems, which can deal with unstructured or 'fuzzy' data, in the storage of voice and graphic material, and new ways of interrogating the database and receiving the information – voice, graphics etc. Many of the developments are, of course, related to the work to be undertaken following the Government's endorsement of the proposals of the Alvey Committee;

v. the provision of adequate statistics on the tradeable information sector. Current statistical classifications do not allow sensible analysis of this commercial area; they are weighted heavily towards the manufacture of traditional products (ie the manufacture of products not involving new technology). This is a grave defect which should be rectified in order for sensible conclusions to be drawn about the sector's development.

Education and training

6.17 The educational system will, we believe, have a profound part to play in equipping the UK population with the skills – and perhaps more importantly the attitudes – necessary to bring success in the information business. Schools will need to provide tuition in the use of computer-based information systems; this will grow naturally out of the spread of computers in schools since users will wish to interact with distant databases. They will also be customers for a wide range of educational software, which should be capable of meeting overseas demands also, just as UK textbooks are sold extensively abroad. Above all, they should inculcate the concept that information has value, and that this value is the foundation of much economic activity. This may have consequences which fit ill with current practices, for example an end to illicit free copying of copyright material. But the value to the nation of a proper regard for information and its commercial worth would far outweigh these. And it must be right to imbue in schoolchildren a due sense of the foundations of economic wealth.

6.18 We commend the initiatives already taken to introduce schoolchildren to information technology. But their ultimate success will depend not on the hardware supplied, but on the software available, which will determine the range of subjects that can be effectively tackled with the aid of microcomputers, and the enthusiasm and imagination of teachers. We acknowledge the current concern in the education Departments and the Department of Trade and Industry about the supply of software. It is, in our view, a priority area. We would stress, however, the importance of meeting overseas markets for such material. Despite current pressures, the educational system of the UK still ranks at all levels among the best in the world, and many overseas students continue to come to this country. This should be exploited to our commercial advantage in the supply of education overseas, using all the aids that IT can provide.

6.19 In higher education the Open University has pioneered the use of new methods of communication for teaching purposes at degree level. The Open Tech will similarly employ IT to provide training and re-training courses. We regard these as major pointers to the future. The OU's experience should be exploited vigorously in overseas markets and Government should encourage it to be entrepreneurial in approach, for example by allowing it to retain all its overseas earnings. The Open Tech should be similarly encouraged to aim for its share of the huge world market for training and re-training once it has established itself in the UK. And of course such initiatives should not be confined to public sector organisations; there is much expertise in training within the private sector which might be exploited in wider markets. In this connection, we would draw attention to a report recently prepared for the Council for Educational Technology on the potential of interactive video techniques for education and training, which we believe both provides a sound basis for further discussion and some pointers to future initiatives.

6.20 Finally, we suggest that educational establishments will come under increasing pressure from the sorts of developments that we have discussed in this report. Some commentators, having noted that technology has sometimes turned a service into a consumer good (eg the fractional horsepower electric motor turned the laundry into the washing machine) have speculated whether microelectronics could do the same for education. The parallels are, of course, not exact – but video discs, home computers, etc, will provide parents with opportunities for the purchase of effective teaching aids in a way not previously open to them. We make no firm predictions, but note that educational institutions generally will need to make effective use of new technologies in order to maintain their position against competing sources of tuition and information.

Academic studies

6.21 We suggest that more academic interest in this developing commercial area could be useful. Some of the more illuminating analyses of the impact of new technology on the sorts of activities discussed in this report have come from the Centre of Information Policy Research at Harvard University. A corresponding unit in the UK, perhaps located within the Science Policy Research Unit at the University of Sussex or the recently created Technical Change Centre, could provide analyses of relevance to Government and industry alike. It would serve as a focus for the other university and polytechnic groups now working in different parts of this field. Government, the Science and Engineering Research Council and the Social Science Research Council should give this further attention.

Concluding comments

6.22 We have made no detailed recommendations. This is deliberate – our aim has been to sketch an area of developing economic importance, to show how technology is forming new links, creating new interest groups and providing the UK with new commercial opportunities in which it has certain natural advantages. We hope that this report will help to create a climate in which technology may be seen not as an end in itself, but as a means for the better delivery of information and in which due attention is therefore given to the content and value of the information transmitted. An important contribution to such a climate could come from a Government inspired awareness exercise, on the lines of IT Year. This could appropriately be timed to coincide with the introduction of new copyright legislation and would need to involve all the relevant trade associations. The lead would be taken by whichever Department carried the principal co-ordinating responsibility referred to in paragraph 6.12.

6.23 The UK moved from an awareness of microelectronics in 1978 to an awareness of IT in 1982 as knowledge and understanding of new technological developments increased. We look to a further shift to an awareness of information as a commercial commodity in the next few years, as we truly enter the Information Age.

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Annex B

Relevant technical developments

1 This Annex outlines developments in Information Technology that will affect the tradeable information sector.

Satellite telecommunications and broadcasting

2 The use of satellites in geo-stationery orbit to provide telecommunications links is now widespread. Three such satellites, appropriately positioned, can cover the whole globe, enabling communications to be established relatively easily with remote locations. As well as linking fixed points, satellites now provide improved communications with ships and future developments will probably include serving other mobile receivers (cars, trucks etc) with, through improved electronics, smaller reception dishes. By increasing the power of the signal transmitted by the satellite, reception with dishes less than 1m in diameter is possible, enabling satellite receivers to be afforded by individual households. Direct broadcasting by satellite (DBS), services will start in Europe in 1985/6, with France, West Germany and the BBC having firm plans for services. The signal from each country's satellite cannot, however, be confined only to that country. There will be overspill in adjoining areas and the international reception of TV signals is therefore possible. Further enlargement of the area of reception could come from the use of cable systems (see below) where the cost of a larger receiving dish may be spread over a number of subscribers.

3 Broadcasting satellites offer the opportunity for new telecommunications services, either through the use of teletext technology during the transmission of programmes, or through the distribution of information during 'silent' hours. This could enable instructions to be relayed simultaneously to widely scattered receiving points, eg financial and stock details to a chain of stores or printing instructions to a number of newspaper presses.

Packet switching

4 Packet switching is another product of the convergence of computers and communications. Previously, links between computers or between a computer and remote terminals could be provided only by using permanently connected lines or by dialling a connection through the public telephone system. In either case, the charge for the connection would be related to the distance covered.

5 In packet switching networks, subscribers are linked to a local access point where the continuous output of the computer is turned into small discrete 'packets' of data. The packets of many subscribers are concentrated and then routed through the appropriate 'nodes' in the network to the receiving access point. The nature of the network is such that packets can take different routes to their destination, thus bypassing congestion in the network, and so some packets will travel further than others to reach their destination. In such a network, therefore, the costs incurred cannot be determined by the distance travelled, and charges have to be based on the amount of information sent. This makes it feasible for small volume customers to use distant services that they would not use if the charges were based on long distance telephone charges.

Cable systems

6 The White Paper 'The Development of Cable Systems and Services' (Cmnd 8866) set out the Government's plans for broadband cable systems, which were inspired by the Advisory Panel's report *Cable Systems*. Such systems will enable new forms of video information service, combining elements of moving video pictures, text, selection and interaction with the subscriber. The information can be stored in remote computer memories, or more locally in video discs, depending on the application. The first new cable systems, allowing full interaction between subscribers and information sources, will start operation in the UK in the mid-1980s, and similar developments will take place overseas, thus opening the opportunity for international links.

Personal computers

7 The past few years have seen a phenomenal growth in the popularity of micro-computers in homes and small businesses. The UK now has a higher penetration of personal computers in households than any other country. With declining costs of data storage, and a greater range of software, future models will allow much more complex tasks to be undertaken,

including in particular self-education and instruction either from locally-held programs or by access to other computers.

Viewdata and teletext

8 The TV set is becoming far more than a passive entertainment device. Through the development of viewdata, it can act as a computer terminal, linked through the telephone network to a remote database. Viewdata technology can provide cheap and rapid access to an enormous range of information, and the potential for public viewdata is very large. Recent changes in the organisation and marketing of Prestel are making the service more orientated to the subscriber's needs. Moreover, initiatives such as the supply of a wide range of software to personal computers will increase the attractiveness of Prestel. Future developments (including 'picture Prestel') will significantly extend its range.

9 Teletext ('Ceefax' and 'Oracle') is already well established, with one million sets in use in the UK, as a result of a concerted and effective marketing campaign involving set suppliers, the retail and rental trade and the broadcasting authorities. One development associated with cable systems may be the provision of 'full channel' teletext where the information frames, instead of occupying 4 or 6 lines out of the 625, occupy the whole channel, and so the number of frames that can be accessed in a reasonable time is correspondingly increased (to the order of 100,000). Although still small by comparison with the information available on a viewdata system (eg Prestel currently has 220,000 frames), this could cover much of the information used by the general public.

Communicating word processors

10 Increasingly, text is being prepared and edited by electronic means. Word processors are becoming more common in offices. At present, these are usually 'stand-alone' machines, but the development of international standards for the transmission of text in digitised form (especially 'teletex' standards – see below) opens the way to communications between word processors in different locations. Thus a newsletter prepared in one centre would be printed out immediately in whole or in part at other locations.

Teletex

11 Telex is a traditional, though popular and growing, means of text communication within the UK and internationally. However, it is slow

and has a limited character set. Teletex is a new form of text communication, with a much wider range of characters (including upper and lower case letters), and standard procedures for transmitting these in the digitised form recommended in the international telecommunications body, CCITT. It has relevance to all forms of text communication, whether between offices, between authors and publishers, or publishers and readers. Teletex terminals are now becoming available and both UK and international services have started.

Facsimile

12 Like telex, facsimile is well established and is widely used for sending non-text information. But it has suffered from slowness, poor quality of output and lack of standardisation, which meant that equipment from different manufacturers often could not communicate. Again, international standards have become available to overcome these problems, and further standards are being prepared to allow yet greater speeds, and additional facilities.

13 The improvements in speed that have resulted from the use of digital facsimile transmissions reduce the time taken to send an average page of A4 text from the four minutes of the early analogue machines to 20 seconds for present digital equipment. They also improve quality and enable all machines following the standard to communicate with each other. Further standards, giving higher speed and better resolution, are planned. For the rapid transmission of diagrams, pictures etc, facsimile has much to commend it, and these developments should add greatly to its usefulness.

Optical discs

14 The storage of information on discs by optical means is now starting and both consumer and business products are available. The information storage capacity of an optical disc, where a laser is used to detect the pattern of pits on the surface, is much greater than that of the magnetic discs already familiar in computer rooms. Each disc can store 54,000 frames of video material. Some early applications have involved the provision of a stores catalogue on a disc, with pictures of the items stocked. This information could in principle be available remotely and could be associated with an ordering system. Many other applications are forecast, particularly in the fields of education and training, because of the ease with which different items of information on the disc may be accessed and the

opportunities thus opened up for interactive, 'branching' teaching programmes.

Video cassettes

15 These are now very familiar. They provide an extra outlet for the work of creative artists but are not as suited as discs to the interactive supply of information because it is more difficult to access individual frames rapidly. Nevertheless, some firms are finding them important aids to training, marketing and publicity.

Improved screens

16 The TV screen provides a relatively coarse-grained image; it cannot, for example, display legibly an A4 page of text. The declining cost of microelectronics will make higher definition screens more available for office use and fine detail and colour may be expected to be much more common. High definition TV transmissions may commence, aided by the new developments in satellite and cable transmissions, but clearly the existence of a huge investment in conventional TV screens will inhibit the rapid spread of high definition TV in the home.

Laser printing

17 Conventional dry copiers use an optical system to create an image of the document to be copied on a drum coated with selenium which is then charged to a high voltage. Laser printers use a laser to create a similar image from information in a computer store. They thus make possible the use of multiple fonts and variable size characters on the same page. Such printers can operate at high speed, typically two pages per second. In some circumstances, eg where demand is uncertain, it can be more economical to print documents 'on demand' using a laser printer rather than printing in anticipation of demand. This facilitates the up-dating of the information, avoiding amendment slips etc. The originator of the text can, of course, be physically separate from the printer, allowing local printing of documents from a central source.

Printed in UK for HMSO Dd 736710
C30 9/83